



## REMARKS

The Office Action indicates that the IDS reporting four US patents and one Japanese patent that was filed on January 23, 2001, fails to comply with 37 C.F.R. § 1.98(a)(1) because Applicant did not provide a Form PTO-1449. Applicant respectfully submits that Form PTO-1449 was included with the IDS material filed on January 23, 2001. Copies of the acknowledgment of receipt card and certificate of mailing by US Express Mail, each listing PTO-1449 as part of the filed material, and copies of the Supplemental Information Disclosure Statement and PTO-1449 as filed are attached hereto. Applicant requests that this IDS material be made of record in the examination of the present patent application.

Claims have been amended. No new matter has been added.

Applicant submits this Amendment "B" and Response for the Examiner's consideration. Reexamination and reconsideration of the application, as amended, in view of the following remarks are respectfully requested.

### 1. STATUS OF THE CLAIMS

Claims 1-20 were presented for examination and they stand rejected and pending in the application. These claims have been amended and the rejections are addressed below.

### 2. RESPONSE TO REJECTIONS

#### 2.1. Claim Rejections Under 35 U.S.C. § 102(e)

Claims 1, 3-11 and 13-20 stand rejected in view of Tseng, U.S. Pat. No. 5,643,819 (hereinafter "Tseng"). The present independent claims, and by incorporation the corresponding dependent claims recite, *inter alia*, a contact plug that extends over the spacer and over a portion of

the undoped silicon dioxide cap and such that its lateral wall is not vertical. These structural features are not disclosed in Tseng. Furthermore, the present claims also recite a refractory metal layer that “is disposed along said lateral wall of said contact plug, said refractory metal layer having said contact plug on one of its two opposite sides and having said spacer and said layer of doped silicon dioxide on the other of said sides, such that said refractory metal layer comprises one of the materials selected from the group consisting of a refractory metal, a refractory metal silicide, and combinations thereof”. This element and its features are not disclosed in Tseng.

Because of at least the structural features and elements presently recited in the pending claims are not disclosed in Tseng, the pending claims do not read on Tseng, and consequently Tseng does not anticipate the pending claims. For these reasons, Applicant respectfully requests the reconsideration and withdrawal of this rejection.

## **2.2. Claim Rejections Under 35 U.S.C. § 103(a)**

Claims 2 and 12 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Tseng. Claim 2 depends from independent claim 1, and claim 12 depends from independent claim 11. These independent claims have been amended to recite the elements and features referred to in the foregoing subsection 2.1, and thus such elements and features, together with the rest of structural elements and features in these claims are respectively incorporated into claims 2 and 12. Accordingly, Tseng does not disclose all the elements presently recited in the presently claimed structures, and Tseng does not suggest the manufacture of a structure as a whole with the elements and features as presently recited that would effectively solve the problems that are addressed and solved by the claimed structures.

For these reasons, Applicant respectfully submits that Tseng does not establish a *prima facie* case of obviousness regarding the present claims 2 and 12, and thus respectfully requests the reconsideration and withdrawal of this rejection.



### CONCLUSIONS

In view of the above, Applicant respectfully maintains that the present application is in condition for allowance. Reconsideration of the rejections is requested. Allowance of the pending claims at an early date is solicited.

In the event that the Examiner finds any remaining impediment to a prompt allowance of this application which could be clarified by a telephonic interview, or which is susceptible to being overcome by means of an Examiner's Amendment, the Examiner is respectfully requested to initiate the same with the undersigned attorney.

Dated this 15<sup>th</sup> day of November 2001.

Respectfully submitted,

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Marked up Version of the Pending Claims Under 37 C.F.R. § 1.121(c)(1)(ii):

Applicant submits the following marked up version only for claims being changed by the current amendment, wherein the markings are shown by brackets (for deleted matter) and/or underlining (for added matter):

1. (Once Amended) A gate stack structure situated over a [base] semiconductor material layer, said gate stack structure comprising:

a gate oxide layer on said [base] semiconductor material layer;

a gate layer, [composed of] comprising a first conductive material, on said gate oxide layer;

a layer of refractory metal silicide on said gate layer;

an undoped silicon dioxide cap on said layer of refractory metal silicide;

a spacer over a lateral side of the gate layer and in contact with said [base] semiconductor material layer, said spacer [being composed of] comprising a nonconductive material, wherein the lateral side of the gate layer is oriented perpendicular to said base semiconductor material layer;

a contact plug having a base in contact with said [base] semiconductor material layer, [composed of] said contact plug comprising a second conductive material[,] and being situated adjacent to the gate layer, over said spacer, and over a portion of said undoped silicon dioxide cap, said contact plug having a top and a lateral wall extending from said top to said base, wherein said lateral wall is not vertical along its height from said top to said base; and

a layer of doped silicon dioxide over said spacer, over said undoped silicon dioxide cap, and [in contact with] adjacent to said contact plug, wherein a refractory metal layer is disposed along said lateral wall of said contact plug, said refractory metal layer having said contact plug on one of its two opposite sides and having said spacer and said layer of doped silicon dioxide on the other of said sides, such that said refractory

metal layer comprises one of the materials selected from the group consisting of a refractory metal, a refractory metal silicide, and combinations thereof.

2. (Once Amended) The gate stack structure as recited in Claim 1, wherein said nonconductive material [is composed of] comprises silicon nitride.

3. (Twice Amended) The gate stack structure as recited in Claim 1, wherein:  
said nonconductive material [is composed of] comprises undoped silicon dioxide;  
and  
the spacer is made from the same material as the undoped silicon dioxide cap.

6. (Once Amended) The gate stack structure as recited in Claim 1, wherein said layer of doped silicon dioxide layer [is composed of] comprises a material selected from the group consisting of BPSG, PSG, and BSG.

7. (Once Amended) The gate stack structure as recited in Claim 1, wherein the spacer [is composed of] comprises a material that is one of silicon nitride and undoped silicon dioxide.

9. (Once Amended) A gate stack structure situated over a [base] monocrystalline silicon layer, said gate stack structure comprising:

- a gate oxide layer on said [base] monocrystalline silicon layer;
- a polysilicon gate layer on said gate oxide layer;
- a layer of tungsten silicide on said polysilicon gate layer;
- an undoped silicon dioxide cap on said layer of tungsten silicide;
- a spacer over a lateral side of the gate layer and in contact with said [base] monocrystalline silicon layer, said spacer [being composed of] comprising undoped silicon dioxide and being integral with the undoped silicon dioxide cap, wherein the lateral side of the gate layer is oriented perpendicular to said base monocrystalline silicon layer;
- a contact plug having a base in contact with said [base] monocrystalline silicon layer, said contact plug comprising a second conductive material and being adjacent to said gate layer, over said spacer, and over a portion of said undoped silicon dioxide cap, said contact plug having a top and a lateral wall extending from said top to said base, wherein said lateral wall is not vertical along its height from said top to said base; [and being:
  - composed of a second conductive material; and
  - situated adjacent to the gate layer;] and
  - a layer of doped silicon dioxide [being composed of] comprising a material selected from the group consisting of BPSG, PSG, and BSG, and being situated over said spacer, over said undoped silicon dioxide cap, and [in contact with] adjacent to said contact plug, wherein a refractory metal layer is disposed along said lateral wall of said



contact plug, said refractory metal layer having said contact plug on one of its two opposite sides and having said spacer and said layer of doped silicon dioxide on the other of said sides, such that said refractory metal layer comprises one of the materials selected from the group consisting of a refractory metal, a refractory metal silicide, and combinations thereof.

10. (Twice Amended) A gate stack structure situated over a [base] monocrystalline silicon layer, said gate stack structure comprising:

- a gate oxide layer on said [base] monocrystalline silicon layer;
- a polysilicon gate layer on said gate oxide layer;
- a layer of tungsten silicide on said polysilicon gate layer;
- an undoped silicon dioxide cap on said layer of tungsten silicide;
- a spacer over a lateral side of the gate layer and in contact with said [base] monocrystalline silicon layer, said spacer [being composed of] comprising a material that is one of silicon nitride and undoped silicon dioxide and being made from the same material as the undoped silicon dioxide cap, wherein the lateral side of the gate layer is oriented perpendicular to said [base] monocrystalline silicon layer;
- a contact plug having a base in contact with said [base] monocrystalline silicon layer, said contact plug comprising a second conductive material and being adjacent to said gate layer, over said spacer, and over a portion of said undoped silicon dioxide cap, said contact plug having a top and a lateral wall extending from said top to said base, wherein said lateral wall is not vertical along its height from said top to said base; [and being:

  - composed of a second conductive material; and
  - situated adjacent to the gate layer;] and
  - a layer of doped silicon dioxide [being composed of] comprising a material selected from the group consisting of BPSG, PSG, and BSG, and being situated over said spacer, over said undoped silicon dioxide cap, and [in contact with] adjacent to said contact plug, wherein a refractory metal layer is disposed along said lateral wall of said

contact plug, said refractory metal layer having said contact plug on one of its two opposite sides and having said spacer and said layer of doped silicon dioxide on the other of said sides, such that said refractory metal layer comprises one of the materials selected from the group consisting of a refractory metal, a refractory metal silicide, and combinations thereof.

11. (Once Amended) A gate structure comprising:

a pair of gate stacks situated over a [base] semiconductor material layer, each said gate stack comprising:

- a gate oxide layer on said [base] semiconductor material layer;
- a gate layer, [composed of] comprising a first conductive material, on said gate oxide layer;
- a layer of refractory metal silicide on said gate layer;
- an undoped silicon dioxide cap on said layer of refractory metal silicide; and

a spacer in contact with a lateral side of each said gate stack and with said [base] semiconductor material layer, said spacer [being composed of] comprising a nonconductive material, each said lateral side of each said gate stack being perpendicular to said base semiconductor material layer;

a contact plug having a base in contact with said [base] semiconductor material layer, said contact plug comprising [composed of] a second conductive material[,] and being situated between said pair of gate stacks, over said spacer, and over a portion of said undoped silicon dioxide cap, said contact plug having a top and a lateral wall extending from said top to said base, wherein said lateral wall is not vertical along its height from said top to said base; and

a layer of doped silicon dioxide over said spacer, over said undoped silicon dioxide cap, and [in contact with] adjacent to said contact plug, wherein a refractory metal layer is disposed along said lateral wall of said contact plug, said refractory metal

layer having said contact plug on one of its two opposite sides and having said spacer and said layer of doped silicon dioxide on the other of said sides, such that said refractory metal layer comprises one of the materials selected from the group consisting of a refractory metal, a refractory metal silicide, and combinations thereof.

12. (Once Amended) A gate structure as recited in Claim 11, wherein said nonconductive material [is composed of] comprises silicon nitride.

13. (Twice Amended) The gate structure as recited in Claim 11, wherein:  
said nonconductive material [is composed of] comprises undoped silicon dioxide;  
and  
each said spacer is made from the same material as a respective one of said undoped silicon dioxide caps.

16. (Twice Amended) The gate structure as recited in Claim 11, wherein said layer of doped silicon dioxide layer [is composed of] comprises a material selected from the group consisting of BPSG, PSG, and BSG.

17. (Twice Amended) The gate structure as recited in Claim 11, wherein the spacer [is composed of] comprises a material that is one of silicon nitride and undoped silicon dioxide.

19. (Twice Amended) A gate structure comprising:  
a pair of gate stacks situated over a [base] monocrystalline silicon layer, each said gate stack comprising:

a gate oxide layer on said [base] monocrystalline silicon layer;  
a polysilicon gate layer on said gate oxide layer;  
a layer of tungsten silicide on said polysilicon gate layer;  
an undoped silicon dioxide cap on said layer of tungsten silicide;

and

a spacer over a lateral side of each said gate stack and in contact with said [base] monocrystalline silicon layer, said spacer [being composed of] comprising undoped silicon dioxide and being made from the same material as the undoped silicon dioxide cap, wherein the lateral side of each said gate stack is oriented perpendicular to said [base] monocrystalline silicon layer;

a contact plug having a base in contact with said [base] monocrystalline silicon layer, [and being composed of] said contact plug comprising a second conductive material[,] and being situated between said pair of gate stacks, over said spacer, and over a portion of said undoped silicon dioxide cap, said contact plug having a top and a lateral wall extending from said top to said base, wherein said lateral wall is not vertical along its height from said top to said base; and

a layer of doped silicon dioxide over said spacer, over said undoped silicon dioxide cap, and [in contact with] adjacent to said contact plug, wherein a refractory metal layer is disposed along said lateral wall of said contact plug, said refractory metal

layer having said contact plug on one of its two opposite sides and having said spacer and said layer of doped silicon dioxide on the other of said sides, such that said refractory metal layer comprises one of the materials selected from the group consisting of a refractory metal, a refractory metal silicide, and combinations thereof.

20. (Once Amended) A gate structure comprising:  
a pair of gate stacks situated over a [base] monocrystalline silicon layer, each said gate stack comprising:

a gate oxide layer on said [base] monocrystalline silicon layer;  
a polysilicon gate layer on said gate oxide layer;  
a layer of tungsten silicide on said polysilicon gate layer;  
an undoped silicon dioxide cap on said layer of tungsten silicide;

and

a spacer over a lateral side of each said gate stack and in contact with said [base] monocrystalline silicon layer, said spacer [being composed of] comprising a material that is one of silicon nitride and undoped silicon dioxide, each said lateral side of each said gate stack being perpendicular to said [base] monocrystalline silicon layer;

a contact plug having a base in contact with said [base] monocrystalline silicon layer, [and being composed of] said contact plug comprising a second conductive material[,] and being situated between said pair of gate stacks, over said spacer, and over a portion of said undoped silicon dioxide cap, said contact plug having a top and a lateral wall extending from said top to said base, wherein said lateral wall is not vertical along its height from said top to said base; and

a layer of doped silicon dioxide over said spacer, over said undoped silicon dioxide cap, and [in contact with] adjacent to said contact plug, wherein a refractory metal layer is disposed along said lateral wall of said contact plug, said refractory metal layer having said contact plug on one of its two opposite sides and having said spacer and



said layer of doped silicon dioxide on the other of said sides, such that said refractory metal layer comprises one of the materials selected from the group consisting of a refractory metal, a refractory metal silicide, and combinations thereof.



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of	Kei-Yu Ko	)	
		)	
Serial No.	09/579,402	)	
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Filed:	May 25, 2000	)	Art Unit
		)	2815
For:	GATE STACK STRUCTURE	)	
		)	
		)	
Examiner:	Eugene Lee	)	

ATTACHMENT TO AMENDMENT "B" AND RESPONSE

The attachment material includes:

1. Copy of acknowledgment of receipt post card
2. Copy of Certificate of Mailing by US Express Mail
3. Copy of Supplemental Information Disclosure Statement
4. Copy of PTO-1449

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